CERTIFICATE

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LIGHT-EMITTING DIODE ILLUMINATED LIGHT-EMITTING MODULE

FIELD OF THE INVENTION

The present invention relates to a light-emitting diode (LED) incorporated light-emitting module suitable for illuminating. More particularly, it relates to a light-emitting diode illuminated light-emitting module based on primary one reflection principle.

BACKGROUND OF THE INVENTION

There are two methods to produce conventionally the LED illuminated module. One method is to solder the LED chip on a circuit board and the light emitted by the LED will be directed out from the front side. The main disadvantage of such type of the modules is that the light-emitting efficiency is too low. The another method is to pack several single LEDs together according to a specific form. The method of directing the light out from the front side is still used in the LED modules produced by such method, thus, the light-emitting efficiency is still low. Moreover the operation principle of the modules installed with an optical processing system is rather complicated, in which the LED modules should be installed manually one by one, therefore, the technique of the modern semiconductor technology can not be used.

SUMMARY OF THE INVENTION

Thus, the object of the present invention is to provide a light-emitting diode illuminated light-emitting module based on primary reflection principle with the features of high light-emitting efficiency and easy to install accurately.

According to the above object of the present invention, a light-emitting diode illuminated light-emitting module will be provided by the present invention, it comprises an optical processing board, a transparent substrate located below said optical processing board, and a reflection board located below said transparent substrate, wherein the electrode pads and the associated connections connecting between said electrode pads are placed on said transparent substrate; the LED chips, which are placed to emit light toward said reflection board, are installed on said electrode pads; the reflection mirrors are installed near said LED chips on the surface of said reflection board.

Because primary reflection principle is used in the LED illuminated light-emitting module of the present invention, therefore, the light-emitting efficiency is high. The structure is compact with excellent sealing. It is easy to be integrated and characterized by the compact

single chip. Especially, the LED chips can be soldered directly on the transparent substrate by using the semiconductor surface mounting technique (SMD), and the heat dissipation will be more excellent and the luminosity can be increased by a large amount. Several LED chips with different colors can be surface mounted together simultaneously so that the excellent mixed color effect can be obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiments of the present invention will be described in detail below in conjunction with the accompanying drawings, wherein:

Fig. 1 is a schematic view showing the structure of the LED illuminated light-emitting module in accordance with an embodiment of the present invention;

Fig. 2 is an optical reflection principle diagram of the reflection board with a parabolic shown in Fig. 1;

Fig. 3 is a schematic view showing the structure of the LED illuminated light-emitting module in accordance with another embodiment of the present invention;

Fig. 4 is an optical reflection principle diagram of the reflection board with a plane surface shown in Fig. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, an embodiment of the present invention is shown in Fig. 1. It can be seen from Fig. 1 that the LED illuminated light-emitting module of the present invention comprises: an optical processing board 1, a transparent substrate 2, a reflection board 7, and a light reflection cavity board 9. The optical processing board 1 is located at the utmost top (external) layer (seen from the direction as shown in Fig. 1, the same below). The transparent substrate 2 is located below the optical processing board 1, and the reflection board 7 is located under the transparent substrate 2 and within the light reflection cavity 10 constructed by the light reflection cavity board 9. On the surface of the transparent substrate 2 near the reflection board 7, the electrode pads and the associated connections 3 used to connect the electrode pads are deposed. The LED chips 4, which are placed to emit light toward the reflection board 7, are soldered on the electrode pads. The transparent and conductive materials can be used to produce these electrode pads and the associated connections 3.

As shown in Fig. 1, the reflection board 7 has a structure of a parabolic shape. Each of the LED chips 4 is placed above each of the parabolic surfaces, and the LED chip 4 is located right at the focus of the parabolic. In order to increase the reflection capability of the reflection board 7, the reflection mirrors can be placed near the LED chips 4 on the surface of the reflection board 7.

Refer to Fig. 2 please, an optical reflection principle diagram of the reflection board 7 with a parabolic is shown in Fig. 2. In Fig. 2, after the dispersing light emitted by the LED chips 4 is reflected by the parabolic, it becomes the parallel light and incidents to the transparent substrate 2 and the optical processing board 1 in turn. Both the transparent substrate 2 and the optical processing board 1 are the light penetrating boards, they can be produced to form a variety of shapes according to the practical requirements. Normally, the transparent substrate 2 can be produced with a plan board shape, of course, it can also be produced with a specific curved surface. The reflection and refraction of the outgoing light can be controlled by the optical processing board 1, thus, the optical processing board 1 can be produced as a convergence lens or a divergence lens to further converge or diverge the outgoing light.

In another embodiment, the optical processing board 1 and the transparent substrate 2 can also be produced integrally.

As shown in Fig. 1, since the reflection board 7 on which the reflection mirrors (the metal reflection films are normally used) are placed is located near the transparent substrate 2 on which the electrode pads and the associated connections 3 are placed, therefore, the short circuit of the electrode pads and the associated connections 3 of the transparent substrate 2 may be caused easily by the reflection mirrors of the reflection board 7. In order to prevent such situation from occurring, the insulation materials (not shown) can be coated over the surface of the electrode pads and the associated connections of the transparent substrate 2. Another method of preventing the short circuit from occurring is to reserve on the reflection mirrors of the reflection board 7 the spaces corresponding to the electrode pads and the associated connections 3 of the transparent substrate 2.

Label 6 in Fig.1 is a hole, which is placed within the light reflection cavity board 9, used for directing the electrodes out. It is used for directing the electrode pads and the associated connections out from this hole 6 to connect with the external control circuits and to control the light emitted from the relative LED chips 4.

Furthermore, for the convenience of installing and integrating the LED illuminated light-emitting module, a fix hole or fix pin 8 can be placed on the bottom of the light reflection cavity board 9. The light-emitting module can be fixed on the auxiliary device through this fix hole or fix pin 8. Furthermore, the fix hole or fix pin may be placed on both sides of the light reflection cavity board 9 (not shown). It is capable to connect and combine with the neighboring LED illuminated light-emitting module through the fix hole or fix pin on both sides. Of cause, the fix holes can be placed on both the bottom and the side of the light reflection cavity board 9 for the convenience of installing and combining flexibly.

In the embodiment shown in Fig. 1, two LED chips 4 and two corresponding parabolic surfaces are shown. It should be understood that single LED chip 4 may be placed only to

configure the monomeric structure according to the practical requirement. Also, a plurality of the LED chips 4 may be arranged in a line to configure an in-line structure. Or, a plurality of the LED chips 4 may be arranged in a plurality of lines to configure an array structure.

Referring to Fig. 3, another embodiment of the present invention is shown in Fig. 3. The structure of said embodiment is basically as same as the embodiment shown in Fig. 1, the only difference between them is that the plane board structure is used for the reflection board 7A of said embodiment. The reflection mirrors are also placed on said reflection board 7A. The optical reflection principle of the plane reflection board is shown in Fig. 4. As shown in Fig. 4, the feature of the structure, in which the plane reflection board is used, is that it is capable to make the light emitted from the LED chips evenly, so the dim region caused by the distance separated between the LED chips will be decreased, thereby the well–distributed light-emitting effect can be obtained.